

sequentially forming an interlayer insulating film and a barrier film on a semiconductor substrate;

making a contact hole in the barrier film and the interlayer insulating film at the same time and forming a plug within the contact hole;

forming an insulation film on the plug and the barrier film and then forming a hole in the insulation film leading to the plug such that an upper surface of the plug and part of the barrier film are exposed;

forming a first conductive film on the insulation film and on and over an exposed part of the barrier film in the hole such that the hole in the insulation film is filled with the first conductive film, and then etching the first conductive film by a chemical mechanical polishing method to thereby form a lower electrode within the hole in the insulation film;

etching the insulation film until the barrier film is exposed, so as to leave the lower electrode in a protuberant manner;

forming a dielectric film that covers the protuberant lower electrode and at least part of the barrier film, and then forming a second conductive film that covers at least part of the dielectric film, said dielectric film being made of a ferroelectric or high-dielectric-constant substance; and

patterning the dielectric film and the second conductive film simultaneously to thereby form a capacitor dielectric film and an upper electrode.

Q2
Sub B3

4. (Amended) A method of producing a semiconductor device, the method comprising:

sequentially forming an interlayer insulating film and a barrier film so as to be supported by a semiconductor substrate;

making a contact hole in the barrier film and the interlayer insulating film at the same time and forming a plug within the contact hole;

forming a first insulation film on the plug and the barrier film and then forming a hole leading to the plug in the first insulation film such that an upper surface of the plug is exposed;

forming a first conductive film over at least part of the first insulation film and within the hole such that the first conductive film within the hole does not fill the hole but covers surfaces defining the hole, and then forming a second insulation film on the first conductive film so as to fill the hole;

etching the second insulation film until an upper surface of the first conductive film is reached, and then etching the first conductive film and the second insulation film in the hole by a chemical mechanical polishing method until the first insulation film is exposed, to thereby form a cup-shaped lower electrode within the hole;

etching the first insulation film and the second insulation film within the hole until the barrier film and the lower electrode are exposed;

forming a dielectric film over the cup-shaped lower electrode such that the dielectric film covers inner and outer peripheries and an inner bottom surface of the cup-shaped lower electrode, and then forming a second conductive film that covers the

ONISHI

Serial No. 09/834,923

cont
A2
dielectric film, said dielectric film being made of a ferroelectric or high-dielectric-constant substance; and

patterning the dielectric film and the second conductive film simultaneously to thereby form a capacitor dielectric film and an upper electrode.

Please add the following new claims:

A3
10. (New) The method of claim 1, wherein the contact hole has the same cross sectional area in both the interlayer insulating film and the barrier film.

11. (New) The method of claim 4, wherein the contact hole has the same cross sectional area in both the barrier film and the interlayer insulating film.

12. (New) The method of claim 1, wherein the dielectric film covers each of an upper surface and all side surfaces of the protuberant lower electrode.

REMARKS

This is in response to the Office Action dated July 17, 2002. Non-elected claim 8 has been canceled, without prejudice in view of the Restriction Requirement. New claims 10-12 have been added. Thus, claims 1-7 and 9-12 are now pending. Attached hereto is a marked-up version of the changes made to the claim(s) by the current